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Behavioural Decision-Making in Sustainable Conservation of Built Heritage

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Abstract The role of heritage buildings in pursuing a more sustainable built environment has been widely discussed in the last decades, from their importance to cohesive and inclusive communities to their contribution to resources conservation and therefore to reducing materials-related carbon emissions. Norms, policies, standards, and design-aid tools have been developed to encourage urban conservation, but a question persists: why are best practices not yet widely implemented? Decision-making processes have an intrinsic behavioural dimension. Decisions are influenced not only by conscious and rational factors related to heritage buildings and their adaptive reuse, but also by a conjugation of social, psychological, and emotional factors related to the designer. This research uses the "Theory of Planned Behaviour" to analyse architects' design decisions and reveal the common beliefs, challenges, and opportunities in the conservation of heritage buildings. The results show that while responsibility for the failure in the implementation of conservation is often attributed to third parties, individual attitudes and personal beliefs strongly correlate to the adopted behaviours and, thus, need to be targeted for effective change. Understanding the behavioural dimension of the decision-making process in the adaptive reuse of built heritage is essential to maximize the effect of tools and policies that support actual change toward the growth of a circular economy and a more sustainable future.

Keywords Heritage · Sustainability · Sustainable conservation · Behavioural decision-making

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1 Introduction

Sustainability is an integral part of the theories and policies for interventions in heritage buildings [1–3]. However, its implementation is still far from optimal. The topic has been introduced in national and European regulations and standards. Research has focused on developing tools and guidelines for good practices, covering economic, cultural, and environmental performance aspects [4–6]. Nevertheless, defining principles is not enough, and implementation depends on decision-making processes that result from conjugating of multiple factors and actors.

Human behaviour is, however, rarely considered a parameter when analysing built heritage conservation processes [7]. In other fields of heritage management, however, behavioural theories in psychology have been used to understand perceptions and intentions to engage in pro-environmental [8–10] and pro-heritage behaviours [11, 12]. For example, Ramkissoon et al. [13–16] studied the factors affecting tourists' destination choices, while other authors analysed residents' intentions to support heritage tourism development [17]. Furthermore, in the field of the sustainable built environment, the "Theory of Planned Behavior" (TPB) has already been used to analyse users' recycling [18], energy consumption behaviours [19], designers' choices for sustainable materials [20] and waste minimization [21].

The "Theory of Planned Behavior"—TPB [22, 23] is one of the most advanced models of behaviour in Sociopsychology, correlating intentions with performed behaviours by considering the effect of intervening events. In this theory, intentions are the most important predictor of behaviour [24]. The consistency between intention and implementation depends on the alignment of three main conditions: (1) attitudes (personal evaluations), (2) subjective norms (normative and social expectations), and (3) perceived behavioural control—PBC (barriers to performance). If these factors are aligned, intentions will likely turn into behaviours. If not, the intention-behaviour gap emerges. Understanding which of these factors are affecting the implementation of intentions is essential to develop interventions that contribute to effective behavioural changes in the built heritage field.

This research aims to analyse which factors are hindering implementation of intended conservation behaviours and verify the contribution of the TPB to further developing effective tools and achieving higher conservation in the adaptive reuse of built heritage for a more sustainable future.

2 Methodology

This research surveyed practitioners (architects and engineers) and observed and analysed architecture students' design decisions. The methodology was structured in three steps: (1) identify modal accessible beliefs in practice; (2) measure the intention-behaviour gap; (3) test the effect of a sustainable assessment tool in the intention-behaviour gap. In the first step of this research, a survey, and a focus group

with practitioners (architects, engineers, and craftsmen) were used to identify the most common perceptions of challenges and opportunities in built heritage conservation. In the second stage, the intention-behaviour gap is measured in the educational context to minimize the impact of external factors and focus the study on internal psychological constructs. A TPB questionnaire was developed and applied with architecture students working in the adaptive reuse of heritage buildings at TU Delft. The questionnaire included five groups of questions regarding a list of building attributes: attitudes (it is valuable to me), subjective norms (it is expected of me), perception of control (it is easy for me), intention (I intend to), and behaviour (I decided to). The same questionnaire was applied later, in phase 3, by a different group of students after using a "building passport" for sustainable conservation. The results of the questionnaires were quantitatively analysed using descriptive statistics, linear and multiple correlations, and Mann–Whitney tests.

3 Understanding the Intention-Behaviour Gap in Heritage Conservation

3.1 Modal Accessible Beliefs: Challenges to Implementation in Professional Practice

From professional practice, the survey and focus group allowed to identify the most common perceptions regarding sustainable heritage conservation [25]. Practitioners show positive attitudes toward heritage conservation; they are proud to participate in a continuous process by contributing to conserving a common built heritage. However, there is a low perceived control over final decisions, with a tendency to an external locus of control. Responsibility for the non-implementation of conservation intentions is attributed to other stakeholders and relates to cooperation with others, economic constraints, limited time, and gaps in knowledge and qualification.

The challenges identified by practitioners in the survey and focus group (see Table 1) are categorised according to the PBC Factors identified by Sheeran [24].

3.2 Measuring the Intention-Behaviour Gap with Architecture Students

While practitioners perceived low control over decisions, architecture students have lower constraints and more creative freedom. Therefore, factors such as limited financial availability, profit, regulations, and coordination between different stakeholders play a minimal role in the design solutions developed. This initial hypothesis was confirmed by the results that show high levels of perceived behavioural control.

Table 1 Challenges pointed out by practitioners

PBC factors [24]	Challenges from practice
Knowledge	Gap in conservation knowledge and awareness of all stakeholders
	Lack of technical information
	Knowledge gap in traditional know-how
	Low awareness of private owners
Ability	Procedures and methodologies are too complex
	Technical capacity of all actors
	Insufficient training of technicians
Resources	Unsuitable deadlines
	Conservation practices are too time-consuming
	Limited financial availability
	Conservation is unprofitable
	Decisions only consider economic criteria
Availability	Existing information is difficult to access
	Insufficient tools to support decision-making
Opportunity	Regulations limit innovative design
Cooperation	Lack of coordination between different stakeholders
	Competing priorities of different stakeholders
Unexpected situations	Unpredictable works due to latent conditions

However, despite this high perceived control over decisions, the results showed a gap between expressed intentions and reported behaviours, with a correlation coefficient of 0.3 (instead of the desirable 1). These results suggest that, despite external factors and perceived control, other factors, such as attitudes and subjective norms, also played an essential role in implementing intentions towards conservation [26].

The results showed that the correlation of attitudes with behaviours is stronger than the correlation of attitudes with intentions. Such correlations suggest a social desirability bias: when expressing intentions, students' personal opinions are mediated by what they perceive as expected (subjective norms); however, actual decisions are motivated by personal beliefs, rather than external pressures.

Contrary to practitioners, students demonstrate an internal locus of control: the non-implementation of expressed intentions is recognized as a self-chosen and autonomous decision derived from personal beliefs and preferences for the design concept. For example, a shared personal belief among the participants was that innovation and sustainability are opposed and incompatible with heritage conservation. These factors are the reasons for not implementing the intention of conserving specific building attributes.

3.3 *Testing the Effectiveness of a Building Passport to Assess the Sustainability of Built Heritage*

Based on the results of the previous phase, a passport to assess the sustainability of heritage buildings was developed and applied by architecture students [27]. This tool was developed to be implemented in an initial phase of the redesign, assessing the value of the existing situation for sustainability, and thus targeting the perceptions expressed by participants that "to be sustainable heritage attributes cannot be conserved". Furthermore, this tool aimed to support designers in defining a design strategy that considers the contribution to the sustainability of what is already there, integrating these resources into a circular process. The building passport covers the core aspects of sustainability [28, 29] with indicators organized in several categories: site, construction, materials, water, energy, indoor environment, community, and values. After assessing every layer of the building, as indicated in Fig. 1, the results support the identification of the most positive aspects and the least positive ones, establishing limits of acceptable change and opportunities for transformation.

Applying the TPB questionnaire to the students before and after using the building passport allows for comparing attitudes and intentions with and without this tool [30]. The comparative results between a group of students applying this tool and a group of students not applying this tool suggested that participants who used the building passport show different attitudes and intentions towards specific building attributes, such as "skin" and "services". On the one hand, specific to the layer "skin", materials

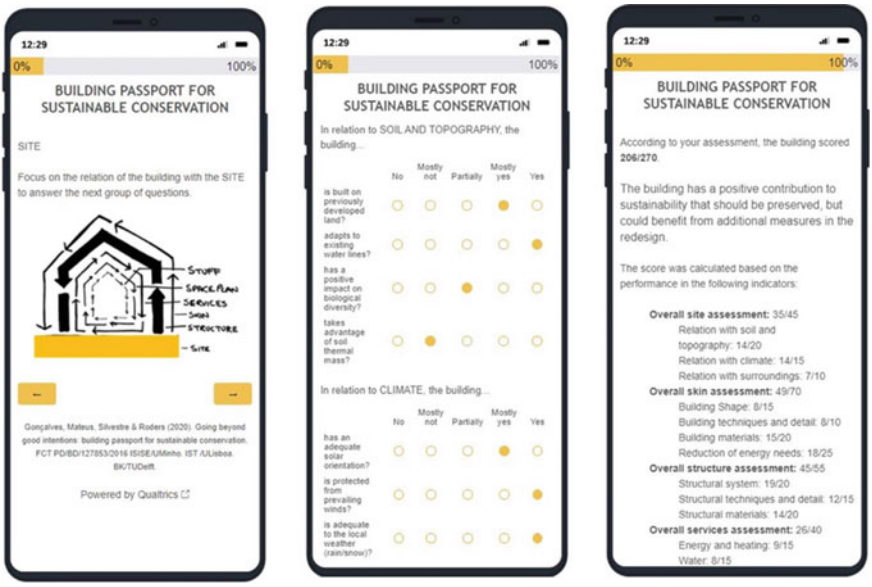

Fig. 1 Mobile the version of the building passport with indication of building layers

and detailing were graded as the most sustainable in the sustainability assessment; relating to more positive attitudes and intentions to conserve these attributes. On the other hand, the layer "services" was considered the least sustainable and is also the least conserved by the students.

While sustainability was pointed out as the reason to not implement conservation intentions by 15% of the students that did not implement the building passport, only 5% of the students that used this tool presented the same justification.

4 Discussion and Conclusions

This research presents an innovative approach to analysing heritage conservation design decisions considering the underlying psychological factors. Using TPB to measure the intention-behaviour gap contributes to a better understanding of the factors affecting the implementation of intentions for conservation in built heritage.

The results show that low perceived behavioural control affects practitioners' implementation of sustainable conservation intentions, with knowledge, skills, and resources emerging as the main challenges in practice. However, applying the TPB to architecture students has proven that personal attitudes are key in determining the implementation of conservation intentions. These results confirm the ones from previous studies in the field of psychology [31], which indicate that attitudinally driven intentions are more likely to be performed since they are self-chosen and not externally imposed. Norms and building codes, while necessary, may not be sufficient to ensure implementation since personal attitudes show a stronger correlation with implemented behaviours than social and normative expectations.

Sustainability is still perceived as the opposite of conservation. This attitude needs to be targeted to change the practice in the future. Testing the developed building passport using the TPB questionnaire allowed this research to confirm the positive contributions of this tool. First, to reinforce attitudes and personal motivations. Second, to increase the student's confidence towards the conservation of building attributes. Third, to strengthen the intention-behaviour relationship. This research targeted the primary belief of the analysed architecture students that sustainability and heritage conservation are incompatible. By being exposed to new information and by being actively engaged in the sustainability assessment, participants show different attitudes, intentions and behaviours towards specific building attributes compared to the respondents in the control group. However, as Fishbein and Ajzen [23] determined, interventions need to target the main beliefs hindering implementation, for being effective in achieving behavioural change. Compatibility with sustainability is one of the factors. However, it might not be the most important one, since aesthetic reasons, limitations to creativity and innovation imposed by pre-existing elements, and compatibility with program requirements are other aspects often pointed out by respondents. Future tools should also be considered to further assist the sustainable conservation of built heritage, targeting aspects such as heritage values, program,

and user requirements. Using the same methodology, with two-phase testing, would allow comparing the achieved change more effectively.

While the results of Lee et al. [20] and Li et al. [21] identified PBC as a stronger predictor of practitioners' behaviour, the current results demonstrate that PBC has a minor role with design students. On the one hand, this confirms the premise of this research. Students have fewer constraints and more autonomy in design decisions in an educational context. On the other hand, it evidences the importance of applying this methodology with design practitioners to verify the influence of other factors such as cooperation with stakeholders, costs, time, or opportunity in the final design decisions.

The results of this research suggest that switching from normative approaches, centred on social pressure and reward, towards approaches that target the internal motivation of designers is essential to achieving an effective change in the field of heritage and sustainability. Future research should address how designers' traits, values, and beliefs are related, adjusting tools to a maximum effect.

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